Food Science and Quality Management
ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online)
Vol.21, 2013
www.iiste.org

Hydatidosis of Camels and Cattle Slaughtered In Sokoto State, Nothern Nigeria.

[1]OKOLUGBO, B.C; [2]LUKA, S.A; [2]NDAMS, I.S.
[1]DEPARTMENT OF ANIMAL AND ENVIRONMENTAL BIOLOGY, DELTA STATE UNIVERSITY ABRAKA,
[2]DEPARTMENT OF BIOLOGICAL SCIENCES AHMADU BELLO UNIVERSITY, ZARIA.
Corresponding Author: get2bernard@yahoo.com

Abstract
This investigation was carried out from January to March 2010 in the Sokoto metropolitan Abattoir to assess the current status of hydatidosis in camels and cattle. Based on routine meat examination, hydatid cyst count and characterization was conducted. A total of 189 camels and 285 cattle were examined. Of these, 84 (44.4%) camels and 5 (1.8%) cattle were found to harbour one or more hydatid cysts. The prevalence rates in the two species of animals were highly significant (P<0.001). The occurrence of the cysts in lungs and liver were 93.2% and 6.7% in camel and 25% and 75% in cattle. A total of 104 cysts were collected from camels, out of which 73(70.2%) were small and 31(29.8%) were medium sized. The 5(100%) cysts recovered from the cattle were all small cysts. There was no association (X^2 = 3.695 and 3.2 at p>0.05) between size of the cyst and organs infected in camels and cattle respectively. In camels, 82(79%) cysts recovered were fertile, 15(14%) were sterile and 7(8%) were calcified. Similarly, 4(80%) cysts from cattle were sterile while 1(20%) was calcified. The study concludes that hydatidosis could be a health problem in this area if not checked because of the high prevalence recorded which might be due to the presence of socio-economic conditions favourable for the disease and maintenance of high level of infection. There is therefore need for serious attention for its prevention and control.
Key words: hydatidosis, prevalence, cyst, camels, cattle

1. INTRODUCTION

Hydatidosis is a cosmopolitan zoonotic disease caused by the larval stage of cestodes in the genus *Echinococcus* (Family Taeniidae). It is characterised by long term growth of metacestode (hydatid cysts) in the intermediate hosts, mostly camels and cattle (Zhang *et al*., 2003).
Hydatidosis is a global human and animal health problem with increasing economic importance (Lightowlers *et al*., 2000). In particular, the movement of infected livestock increases the potential for transmission thus creating new areas of endemicity (Wulamu *et al*., 2002).
Hydatidosis has worldwide distribution and variable geographical incidence (Craig *et al*., 2003). It is highly distributed in underdeveloped countries, especially in rural communities where humans maintain close contact with dogs, the definitive host and other domestic animals, that act as intermediate hosts (Mohammad and Nezhat, 2004). Other factors such as agricultural practices, indiscriminate home slaughtering and poor disposal of offals from infected livestock, lack of adequate control policy, uncontrolled movement and commerce of animals and their products, and the difficulty in early diagnosis have enhanced the distribution of the disease (Dada and Belino, 1979).
Hydatid cysts are most commonly localised in the liver, lungs and spleen of domestic animals and this often result in significant economic losses, particularly with high organ condemnation. Galassi and Mazzini (1985) reported that the presence of hydatid cysts in commercial viscera is the main source of seizure. It is responsible for great economic losses in regions with animal husbandry (Regessa *et al*. 2000; Kaplan and Baspinar, 2009).
The diagnosis of hydatidosis in livestock is commonly made at slaughter and often based on post-mortem findings through palpation of organs (Dada and Belino, 1978). Luka *et al*., 2009 reported that abattoir records are important in the surveillance of hydatid disease but are very difficult to identify small lesions in the lungs/or liver of young animals without additional histological examinations.
In Nigeria, particularly in Sokoto, the disease is underreported and its current status unknown. This study therefore seeks to provide data on the prevalence of the disease among camels and cattle slaughtered in the Sokoto metropolitan abattoir especially with respect to the current trend of large influx of camels from the neighbouring border towns and its
acceptance as food in Northern Nigeria.

2. MATERIALS AND METHODS

The study was an active abattoir survey, which includes camels and cattle registered for slaughter brought from various localities to the Sokoto metropolitan abattoir. Information about the abattoir and the slaughtered animals

such as availability of/source of water, method of disposal of infected offal, source/origin of animals etc was obtained in a structured questionnaire prior to the survey. An average of 40 cattle and 7 camels are slaughtered daily in Sokoto abattoir. All camels registered for slaughter during the study period were recruited in the study because of the small number while an average of 15-20 cattle were sampled daily using the simple random sampling method. During ante-mortem examination each animal was given an identification number and age (based on dentition and owner's information), sex and origin of animals were recorded according to the method of Kebede *et al*.(2009).

A thorough meat inspection was conducted on a tota1 of 89 herds of camels and 285 cattle during the study period by the author with the professional assistance of two veterinary doctors, their technicians and auxiliary local meat inspectors. Each organ was accessed macroscopically visually and by palpation and where necessary one or more incisions were made in order to detect smaller hydatid cysts.

The infected organs from which cysts occurred were observed and the total number of cysts were counted and recorded per infected organ. The size of the hydatid cysts was measured with vainer calibre and classified as small (diameter less than 5 cm), medium (diameter between 5 cm and 10 cm) and large (diameter greater than 10 cm) according to the method of Oostburg *et al*. (2000). Individual cysts were carefully incised and examined for protoscoleces and characterized. Fertile cysts had whitish dots on the germinal epithelium, while infertile cysts were further classified as sterile or calcified. Sterile hydatid cysts were further characterized by the presence of a smooth inner lining usually with slightly turbid fluid in its content, while calcified cysts produced a gritty sound feeling up on incision (Soulsby, 1982; Kebede *et al*., 2009).

3. STATISTICAL ANALYSIS

The Student t-Test was used to check for significant differences in infection rate of infected organs while the Chi-square was used to check for association between cyst size and infected organs.

4. RESULTS

Out of the study animals examined which comprised of 189 camels and 285 cattle. Of these, 84 representing (44.4%) camels and 5 representing (1.8%) cattle were found harbouring hydatid cysts. The distribution and number of organs infected with hydatid cysts in camels and cattle are presented described (Table 1). The distributions of hydatid cysts in organs of infected animals were not significantly different between camels and cattle ($p>0.05$). Of the total infected organs, the involvement of the lung and liver accounted for 93.2% and 6.7% in camels and 20% and 80% in cattle respectively.

Single and double infections (i.e. Lung and liver) of organs were recorded. Out of a total of 84 camels harbouring hydatid cysts, 79 (94%) were found involving only a single organ (i.e. lung or liver) and the remaining 5 (6.0%) had double organ involvement. In the case of cattle, all infected animals had single organ involvement i.e. one in the lung and four in the liver (Table 2). The total cyst counts with respect to size in each infected organ for camels and cattle were also described (Tables 3 and 4). There was no statistically significant association between cyst size and organ involvement in both camels and cattle ($X^2 = 3.695$, $X^2 = 3.2$ at $P>0.05$).

Of the total 96 cysts recovered from the lungs of camels, 77 (80%) were fertile, 13 (14.0%) were sterile while 6 (6.3%) were calcified (Table 5). Of the 8 cysts recovered from the liver of camels, 5 (63.0%) were fertile, 2 (25.0%) sterile and 1 (13.0%) was calcified. Similarly, of the total 5 cysts recovered from cattle, the only, 1 cyst recovered from the lung of cattle was sterile while of the four recovered from the liver, 3 (80%) were sterile while 1 (20%) was calcified.

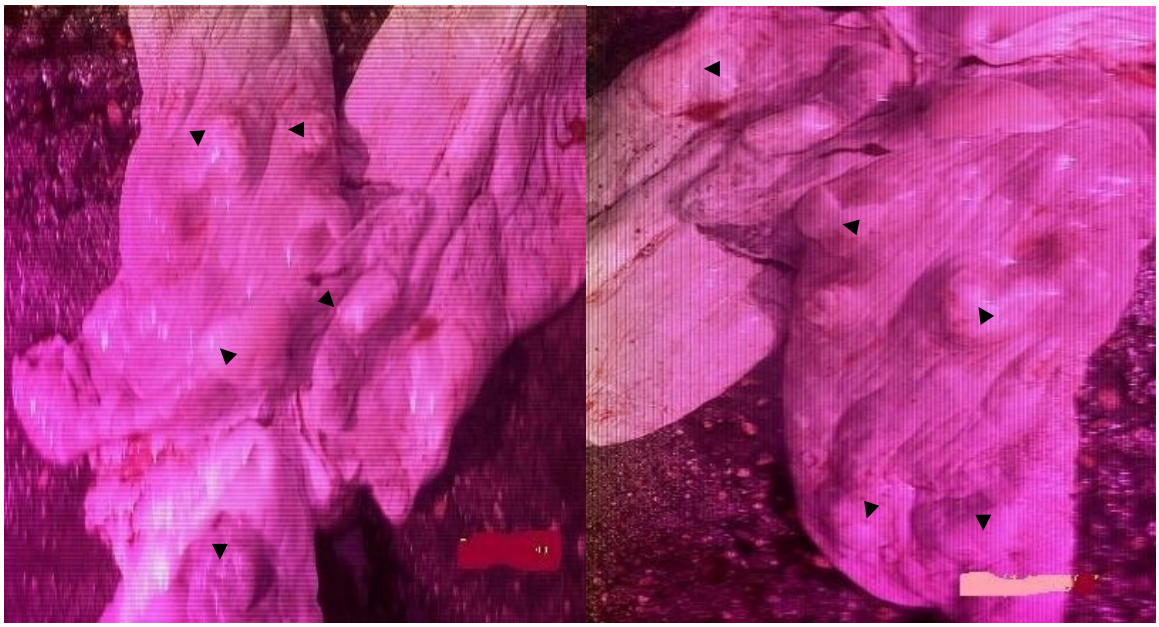

Fig 1- Infected lungs from Camels with arrows showing the presence of hydatid cysts.

Fig 2- Hydatid cysts collected from slaughtered Camels and Cattle. A, B, C, D and E are cysts from camel while F is cyst from cattle.

Table 1: Abundance of hydatid cysts in organs Camels and Cattle

Animal Species	Organ	No. of Infected Organs	Cyst Count			
			Mean	Range	Total	%
Camel	Lung	83 (93.2%)	1.2	1-6	96	92
	Liver	6 (6.7%)	1.3	1-2	8	7.7
Cattle	Lung	2 (20%)	1	1	1	20
	Liver	4 (80%)	1.3	1-2	4	8

Camel (X^2 = 0.084, p > 0.05), Cattle (X^2 = 0.065, p >0.05)

Table 2: Distribution of Hydatid Cysts in the organs of infected Camels and Cattle.

Organs infected	Camel		Cattle	
	(n = 84)	%	(n = 5)	%
Lungs	71	84.5	1	20.0
Liver	8	9.5	4	80.0
Lungs and Liver	5	6.0	-	-
Total	84	100	5	100.0

Table 3: Hydatid cyst characteristics from Camels and Cattle (Small = < 5 cm, Medium = 5 – 10 cm, Large = > 10 cm)

Animal species	Cyst size	Average length (cm)	Average weight (g)	Average vol of fluid (ml)
Camel	Small	2.7 ± 0.1	19.2 ± 1.9	16.2 ± 1.8
	Medium	5.9 ± 0.1	54.3 ± 3.8	37.1 ± 3.6
	Large			
Cattle	Small	1.8 ± 0.2	6.9 ± 2.7	3.9 ± 0.4
	Medium			
	Large			-

Table 4: Number and sizes of cysts recovered in the organs of infected Animals

Animal Species	Organs Infected	Small cysts	Medium cysts	Large cysts	Total
Camel	Lung	65 (67.7%)	31 (32.3%)		96
	Liver	8 (100%)			8
Cattle	Lung	1 (20%)			1
	Liver	4 (80%)			4

Camels (X^2 = 3.695, p > 0.05), Cattle (X^2 = 3.2, p > 0.05)

Table 5- Types of hydatid cyst in different organs of infected Camels and Cattle

Animal Species	Organs involved	Cyst condition			
		Fertile	Sterile	Calcified	Total
Camel	Lung	77 (80%)	13 (14.0%)	6 (6.3%)	96
	Liver	5 (63%)	2 (25%)	1 (13.0%)	8
Cattle	Lung		1 (20%)		1
	Liver		3 (80%)	1 (20%)	4

5. DISCUSSION

All over the world there have been different magnitude records of hydatidosis in camels with respect to rates of prevalence. In this study, the prevalence of hydatidosis in camels was 44.4%, slightly lower than the 55.5% reported by Dada and Belino (1979) three decades ago in Sokoto abattoir, but higher than the 26.2% reported by Ogunsan *et al*. (2000) in the same Sokoto abattoir and 20.5% report of Rabi'u and Jegede (2010) in camels slaughtered in Kano abattoir. However, a higher prevalence of 59.3% is being recorded by ELISA in this same study (report in a separate paper). The 59.3% prevalence reported by Okolugbo (2010) from the same abattoir could be attributed to much more sensitivity of the ELISA technique used than the macroscopic methods that had been in use in the past reports.

The situation in cattle, is however different with other reports. The 1.8% prevalence obtained in this study was lower than the 14.7% reported by Dada and Belino (1978) in Kano abattoir but slightly higher than 0.66% of Rabi'u and Jegede (2010) in the same abattoir.

All these differences or variations in prevalence rates in the two species and thus differences in the reports may be due to the strain differences of *Echinococcus granulosus* that may exist (McManus, 2006). This variation could also be related to age factors. In this study, the camels slaughtered were much older than cattle. Gusbi *et al*. (1990) reported that the higher prevalence recorded in camels in most studies as compared to other domestic animals might be due to the fact that camels often grow to maturity before they are being slaughtered; this enables the hydatid cyst to be fully developed and become fertile. Furthermore, records have shown that camels are unlikely to be slaughtered before 8 or 10 years old and therefore the risk of acquiring infection is relatively greater (Ibrahem and Craig, 1998; Kebede *et al*., 2009). This result further indicates the suitability of the dromedary camel as susceptible intermediate hosts of *E. granulosus* (Lightowlers, 1990; Ibrahem and Craig, (1998).

Furthermore, it is believed that older animals were exposed to the disease (parasitic ova) over a long period of time with an increasing possibility of acquiring and sustaining infections. This age related differences in prevalence is also associated with older animals having a greater chance of ingesting larger numbers of *E. granulosus* eggs and the cyst being likely to increase in size and become matured in this long lived host (Ahmed, 1991; Ibrahem and Craig, 1998; Larrieu *et al*., 2001; Luka *et al*., 2010) .

Hydatid cysts occurrence was predominant in the lungs and liver in camels and cattle respectively. This is explained in the light that lungs and liver posses the first great capillaries sites encountered by the migrating *Echinococcus* onchospheres (hexacanth embryo) which adopt the portal vein route and primarily negotiate hepatic and pulmonary filtering system sequentially before any other peripheral involvement (Kebede *et al*. 2009). Previous studies have reported that 68 – 98% *E. granulosus* infection in camels harbour cysts in the lungs where as cysts in the liver were much less frequent with 20 – 32% prevalence (Hamdy *et al*., 1980). Similarly, confirmed preponderance of hydatid cysts to lungs in camels and liver in cattle have been reported by Al-Khalidi, 1998; Ibrahem and Craig, 1998; and Luka *et al*. (2010).

A maximum number of 6 cysts were recovered from a single lung of camel and 2 from the liver of cattle. It could have been more but for the un- cooperative attitude of the butchers and abattoir staff who were always in a hurry and also do not want the value of their meat organs reduced as a result of multiple incisions. This number is fewer than those reported by Ibrahem and Craig (1998) where 25 cysts were recovered from a single lung of camel and Kebede *et al*. (2009) who reported 45 cysts from a single lung of cattle. These variations in cyst abundance could be due to the spatial distribution and the infectivity (biotic potential) of *E. granulosus* eggs, susceptibility and defensive capabilities of the host (Macpherson *et al*., 1985). Comparatively, high proportion of small cyst is reported in this study and this may be due to immunological response of the host which might preclude expansion of the cyst size (Torgerson, 2002; Kebede *et al*., 2009; Larrieu *et al*., 2001).

The higher fertility rate of hydatid cysts in camels than in cattle suggests that camel acts as a main reservoir of infection in maintaining the perpetuation of the domestic life cycle of *E. granulosus* in this area. This finding is in agreement with those of Dada and Belino (1978), Al-khalidi (1998), Ibrahem and Craig (1998), Ogunsan *et al*.

(2000) and Luka *et al*. (2010). The high proportion of sterile and calcified cysts in cattle may generally imply that most of the cysts in cattle are infertile and this underscores the role of cattle in maintaining the life cycle of *E. granulosus.* Furthermore, comparatively, the higher cyst fertility rates in lungs than liver in camels may be due to the relatively softer consistency of lung tissue which could allow easier development of the cyst and the fertility rate of hydatid cysts may show a tendency to increase with the advancing age of the host (Himonas, 1987).

Conclusively, this study has been able to show an increasing rate of hydatidosis in camels and cattle through the years and owing to the presence of socio-economic conditions favourable for the disease and maintenance of high level of infection in the study area, there is need for serious attention for its prevention and control. The construction of abattoirs with appropriate disposal pits particularly in rural areas, obligatory meat inspection services and further investigation into the basic local epidemiological factors enhancing the disease spread in this area is advised.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the staff members of the Sokoto Metropolitan abattoir and Head of Department, Public Health, Faculty of Veterinary Medicine Usman Dan Fodio University Sokoto. Financial assistance was obtained from Dr. (Mrs) Luka UBR grants of the Ahmadu Bello University, Zaria.

REFERENCES

Ahmed L: Incidence of hydatid disease in camels slaughtered at Assiut abattoir. *Assiut Veterinary Medical Journal*; 1991; 24: 274-278.

Al-Khalidi N: Cystic echinococcosis (hydatidosis) in sheep, goats, cattle and camels in Shahat abattoir, Al-Jabal, Libya. Proceedings of the 3rd Annual Meeting for Animal Production under Arid Conditions; 1998; 1: 143-149.

Craig P, Rogan M, Campos-Ponce M: Echinococcosis: disease, detection, and transmission. *Parasitology*; 2003; 127: 5-20.

Dada BJ, Belino ED: Prevalence of hydatidosis and cysticercosis in slaughtered livestock in Nigeria. *The Veterinary Record*; 1978; 103:311-312.

Dada BJ, Belino ED: Prevalence of Bovine Cysticercosis and hydatid disease in Food animals slaughtered in Sokoto State, Nigeria. *International Journal of Zoonoses*; 1979; 6:115-117.

Galassi M, Mazzini C: Enfermedades observadas en la realizacion de 1000 necropsias ovinas efectuadas en el Mercado General de Haciendas de Avellaneda. *Rev. Cs. Agrarias Universidad Catolica Argentina*; 1985; 5: 3-4.

Gusbi A, Awan M, Beesley W: Echinococcosis in Libya. IV. Prevalence of hydatidosis Echinococcus granulosus in goats, cattle and camels. *Annals of Tropical Medicine and Parasitology*; 1990; 84:477-482.

Hamdy I, Mikhil E, Soliman A, Hamed H: A study of hydatidosis in some animals in Egypt. *Journal of Egypt Society of Parasitology*; 1980; 10:43-51.

Himonas C: The fertility of hydatid cysts in food animals in Greece. Helminth zoonosis, Martinus, Nijjh of Publishers, Netherlands; 1987

Ibrahem M, Craig P: Prevalence of cystic echinococcosis in Libya. *Journal of Helminthology*; 1998; 72:27-311.

Kaplan M, Baspinar S: Prevalence and Economic significance of cystic echinococcosis among slaughtered animals in Elazig. *Journal of Animal and Veterinary Advances*; 1998; 8(**9**):1842–1845.

Kebede M, Mitiku A, Tilahun G: Hydatidosis of slaughtered animals in Bahir Dar Abattoir, North-western Ethiopia. *Tropical Animal Health and Production*; 2009; 41:43– 50.

Larrieu E, Costa M, Cantoni G, Alvarez R, Cavagion L, Labanchi J, Bigatti R, Araya D, Herrero E, Alvarez E, Mancini S, Cabrena P: Ovine *Echinococcus granulosus* transmission dynamics in the province of Rio Negro, Argentina, 1980-1999). *Veterinary Parasitology*; 2001; 98:263-272

Lightowlers MW: Cestode infections in animals: Immunological diagnosis and vaccination. *Revista Scientifique et Technologia office International Epizootology*; 1990; 9(**2**):463-487.

Lightowlers MW, Flisser A, Heath DD, Jensen O, Rolfe R: Vaccination against Cysticercosis and Hydatid disease. *Parasitology Today; 2000;* 16:191-196.

Luka SA., Ajogi I, Nock IH, Umoh JU, Kudi AC: Evaluation of Enzyme-Linked Immunosorbent Assay (ELISA) and Western Blotting for the immunodiagnosis of hydatid diseases in sheep and goats: *The Internet Journal of Veterinary Medicine*; 2009; 5(**2**): 1-11.

Luka SA, Ajogi I, Nock IH, Umoh JU, Kudi AC: Seroprevalence of hydatidosis in Domestic animals slaughtered in Kano abattoir, Northern Nigeria. *Biological and Environmental Science Journal for the Tropics*; 2010; 7(**2**):157-162

Macpherson C, Zeyhle E, Romig T: An Echinococcus pilot control programme for Northwest Turkana, Kenya. *Annals of Tropical Medicine and Parasitology*; 1985; 78:188-192.

McManus D: Molecular discrimination of taeniid cestodes. *Parasitology International*; 2006; 55: 31-37.

Mohammed HR, Nezhat I: Biochemical profiles of hydatid cyst fluids of *Echinococcus granulosus* of human and animal origin in Iran. *Veterinarski Arhiv*; 2004; 74(**6**), 435-442.

Ogunsan EA., Umar I.O, Bannor TT, Majiyagbe KA: Hydatidosis in slaughtered Camels in Sokoto State, Nigeria. *Nigerian Veterinary Journal; 2000;* 21:1-9.

Okolugbo CB: Evaluation of enzyme-linked immunosorbent assay in the serodiagnosis of Hydatidosis in camels (*Camelus dromedarius*) and cattle slaughtered in the Sokoto metropolitan abattoir. M.Sc Thesis, Ahmadu Bello University Zaria; 2010 (Unpublished)**.**

Oostburg B, Vrede M, Bergen A: The occurrence of polycystic echinococcosis in Suriname. *Annals of Tropical Medicine and Parasitology*; 2000; 94:247-252.

Rabi'u B, Jegede O: Incidence study of hydatidosis among slaughtered animals at Kano abattoir, Nigeria. *Biological and Environmental Science Journal for the Tropics*; 2010 7 (**2**): 29-34.

Regessa R, Alemante M, Jemere B: Study on the Prevalence of Cystic hydatidosis and its economic significance in Cattle slaughtered at Hawassa Municipal abattoir, Ethiopia. *Tropical Animal Health and Production*; 2010; 42(**5**):977– 984.

Soulsby E: Helminth, arthropod and protozoa of domestic animals. 7th ed. Lea and Tebiger, Philadelphia, U.S.A; 1982.

Wulamu M, Hiroshi Y, Yushito S, Kazuhiro N, Minoru N, Lightowlers M, Akira I: Usefulness of Hydatid cyst fluid of *Echinococcus granulosus* developed in mice with secondary infection for Serodiagnosis of Cystic Echinococcosis in humans. *Clinical and Diagnostic Laboratory Immunology*; 2002; 573-576.

Zhang W, Jun L, McManus P: Concept in immunology and diagnosis of Hydatid disease. *Clinical Microbiology Reviews*; 2003; 16 (**1**): 18-36.